

RESEARCH

FOR THE WORLD

How can our culture affect the characteristics we inherit?

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Ryutaro Uchiyama is a cultural and biological psychologist. He recently completed his PhD at LSE and is now Research Fellow at NTU–Cambridge Centre for Lifelong Learning and Individualised Cognition, based in Nanyang Technological University, Singapore. His current research focuses on the intersection of cultural evolution and cognitive development.

Genes and culture are deeply intertwined, argues researcher **Ryutaro Uchiyama**, who has proposed a pioneering new framework reconciling these two areas.

Your height, your weight, the music you enjoy listening to, whether you're an Olympic athlete or you struggle to run for the bus: how much of this is down to your genes and how much is the result of your environment?

These questions form part of the age-old nature/nurture debate which has been playing out amongst scientists for centuries. It's generally agreed that for many characteristics, your genes and your environment both play a part in how a trait is expressed. For example, your height is partially down to the heights of your parents and partially a result of environmental factors such as nutrition.

The extent to which a characteristic – like height – can be explained by your genes, as opposed to the environment, is called heritability. For example, scientists have estimated that about 60 to 80 per cent of a person's height is determined by their genes and 20 to 40 per cent is determined by their environment.

However, academics at LSE have proposed that the debate goes further than this and have developed a new [dual framework](#) which cuts through the nature/nurture debate and reconciles the roles of genetics and culture in the inheritance of characteristics. They argue that our understanding of the environment is flawed.

"Since its founding, the field of behavioural genetics has quantified the influence of genes by contrasting it with influence from the environment, but it has relied on an impoverished conception of the environment," explains researcher Dr Uchiyama, who was previously based in LSE's Department of Psychological and Behavioural Science.



Dr Michael Muthukrishna is an Associate Professor of Economic Psychology, Department of Psychological and Behavioural Science, and a STICERD Developmental Economics Group Affiliate at LSE; CIFAR Azrieli Global Scholar at the Canadian Institute for Advanced Research; and Technical Director of The Database of Religious History. His research focuses on firstly human evolution, in particular the culture-gene co-evolution of the human brain and secondly cultural evolution, focusing on cooperation, corruption, innovation, and the navigation of cross-cultural differences.



Dr Rachel Spicer is a Postdoctoral Fellow in the Department of Psychological and Behavioural Science at LSE, and serves as the Chief Data Scientist of the The Database of Religious History. She previously undertook a PhD on metabolomics at the European Bioinformatics Institute (EMBL-EBI) and the University of Cambridge.

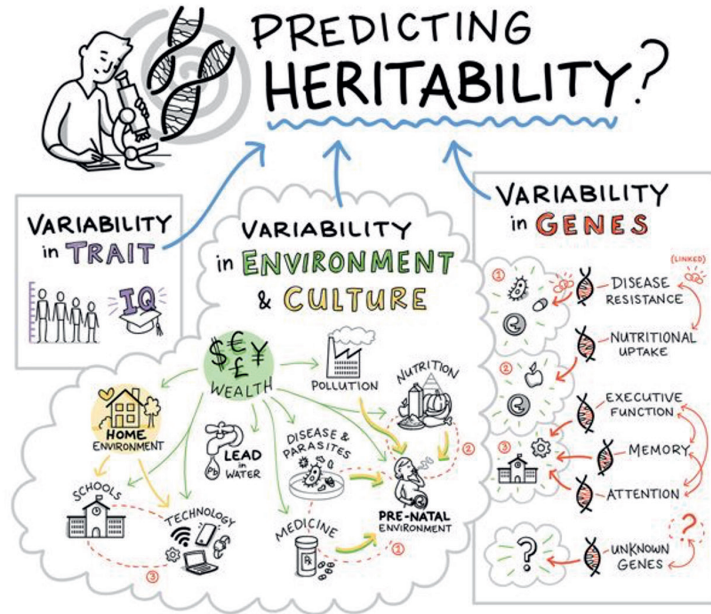


Image: Figure 2 from "Cultural Evolution of Genetic Heritability" by Ryutaro Uchiyama, Rachel Spicer and Michael Muthukrishna, which will be published in a forthcoming issue of Behavioral and Brain Sciences (BBS). Illustrated by Veronika Plant in collaboration with Michael Muthukrishna.

Culture matters

In a forthcoming paper, former LSE PhD student Dr Uchiyama and his co-authors Dr Michael Muthukrishna and Dr Rachel Spicer explain how human environments are structured by cultural evolution. This is the idea that as societies change over time, they progress and evolve to solve problems which threaten or inconvenience human existence.

For example, we have developed sun cream to protect against the threat of skin cancer. We have developed better diets and understandings of nutrition to help protect against the threat of scurvy and other diseases caused by vitamin deficiency.

"The idea that our environments are a result of cultural evolution forces us to reassess the statistical and practical meaning of genetic indices like heritability. We live in a world where we've already solved many problems culturally rather than genetically," says Dr Uchiyama.



The old nature/nurture dynamic is much more complicated than was previously thought to be the case."

If you are more genetically susceptible to skin cancer because you have lighter skin pigmentation, this gene will often not reveal itself because you can use sun cream to protect against it. The impact of genes on a characteristic can, therefore, become masked and the impact of environmental factors such as sun cream can overwhelm the role of genes in determining the trait.

“When you take into account how culture and cultural evolution shape the environment, then you see the idea of heritability in a very different light and realise the old nature/nurture dynamic is much more complicated than was previously thought to be the case,” explains Dr Uchiyama.

He continues: “You can’t so easily say that genes explain X per cent of a trait and the environment explains the other Y per cent because culture may have levelled out the playing field and reduced variation in the environment, making the environment similar for most people in a society or a group within a society. Therefore, in many cases, genes are the only thing left which can explain variation between people after culture has done a lot of the work. People often see the environment as a given without realising how the environment itself is generated and how it evolves.”

Initially, new innovations like the development of sun cream, will increase inequality and variation between groups by giving an early advantage to richer groups, for example. However, as the use and availability of sun cream diffuses through a society, environmental variation will reduce through homogenisation.

Sparking debate

Dr Ryutaro Uchiyama and his colleagues hope the framework will spark vibrant debate about the role of cultural evolution in genetics. Their paper has been accepted by the journal *Behavioral and Brain Sciences* and the team have finished writing a response article to 29 commentary articles from other researchers about the framework.

“Genetics and issues around characteristics like IQ provoke a lot of passion in people so I expect there will be some debate around our proposed framework, simply by virtue of its topic,” muses Dr Uchiyama.

“There have been ongoing unresolved controversies in areas such as genetics and intelligence for decades, and although there are conceptual frameworks which help explain different parts of the puzzle scattered across different fields, they tend to work in silos. Our framework brings together the strands of behavioural genetics and cultural evolution in a way that creates a common framework.”

So, next time you’re wondering why you prefer the Rolling Stones to Beethoven, the answer could be lot more complex than you might think! ■

Dr Ryutaro Uchiyama was speaking to Charlotte Kelloway, Media Relations Manager at LSE.

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